ME 1653 C.2

INSTRUCTION MANUAL

DISTRIBUTION AMPLIFIER

MODEL 203-3

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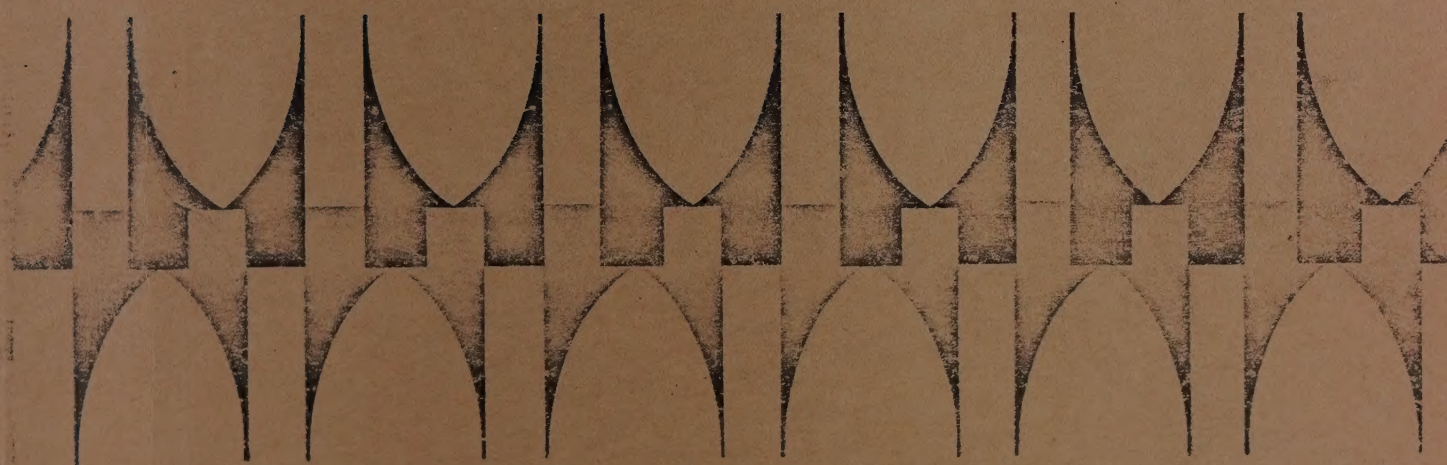

MONTRONICS INC.
SUBSIDIARY OF JOHN FLUKE MFG. CO., INC.
SEATTLE, WASHINGTON

ME-1653

INSTRUCTION MANUAL

DISTRIBUTION AMPLIFIER

MODEL 203-3

(MONTRONICS)

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SECTION I

GENERAL DESCRIPTION

1-1. INTRODUCTION

The Montronics Model 203-3 Distribution Amplifier (see figure 1-1) is an all solid-state unit which accepts three input frequencies of 0.1 Mc, 1 Mc, and 5 Mc and provides ten, fifteen, and five isolated outputs at each of these frequencies. However, multiple combinations of these outputs are possible.

Intended for the distribution of standard frequencies, the unit incorporates three preamplifiers, one for each frequency, followed by ten, fifteen, and five amplifiers for each of the three frequencies. However, multiple amplifier combinations are possible. The preamplifiers and amplifiers are designed for low-noise and linear operation so that the high purity of the input signal is preserved.

NOTE

At BDA and MAD one amplifier has been modified for ten 1-Mc and twenty 5-Mc amplifier outputs. At GDS and MIL one amplifier has been modified for ten outputs for each input frequency and another amplifier for thirty 5-Mc outputs (see table 1-1).

The Model 203-3 includes the following plug-in modules:

Quantity	Description	Montronics Part No.	Length x Width x Height
1	Power Supply	203-3-401	4" x 2-3/8" x 5/8"
1	0.1 Mc Preamplifier	203-3-402	4" x 2-3/8" x 5/8"
1	1 Mc Preamplifier	203-3-403	4" x 2-3/8" x 5/8"
1	5 Mc Preamplifier	203-3-404	4" x 2-3/8" x 5/8"
10	0.1 Mc Amplifier	203-3-407	4" x 2-3/8" x 5/8"
15	1 Mc Amplifier	203-3-406	4" x 2-3/8" x 5/8"
5	5 Mc Amplifier	203-3-405	4" x 2-3/8" x 5/8"

See table 1-1 for applicable station quantities of plug-in modules. (One amplifier module per channel output).

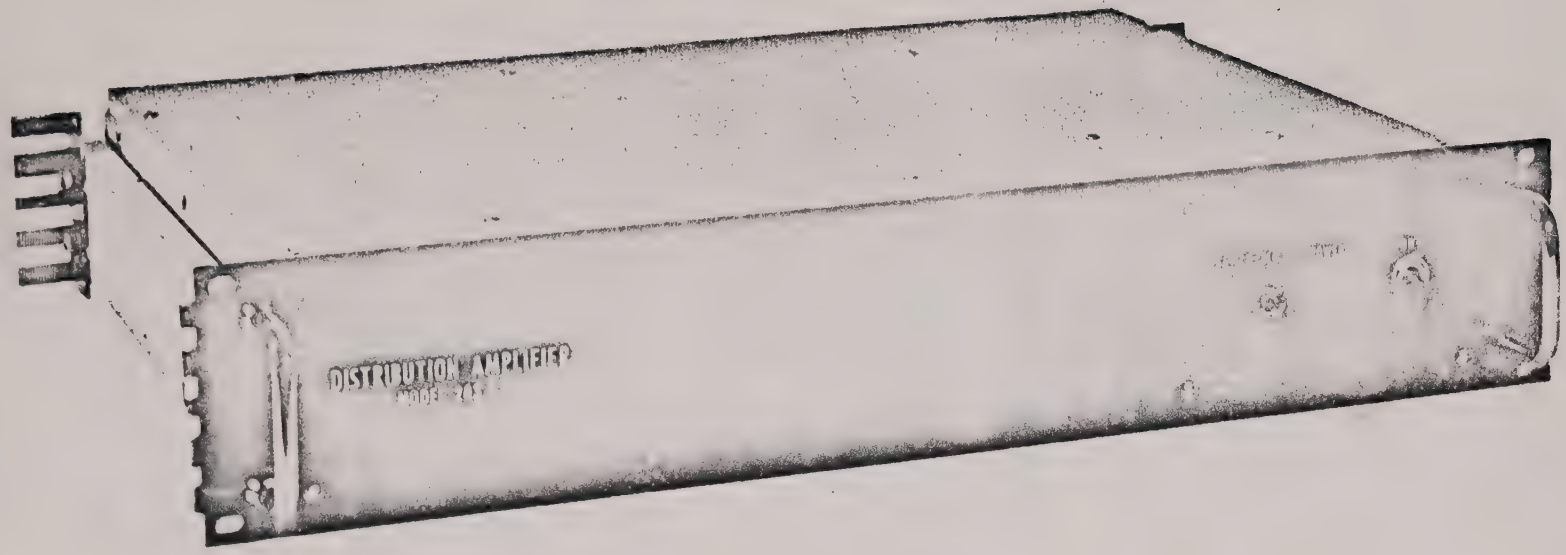


Figure 1-1. THE MODEL 203-3 DISTRIBUTION AMPLIFIER

Packed with the instrument is an accessory package consisting of the following:

Quantity	Description	Montronics Part No.
1	Module Riser	203-2-407
1	Module Puller	302-225
1	Shorting BNC Connector	203-2-412
1	JFD Tuning Tool	153409
1	Mullard Tuning Tool	

1-2. SPECIFICATIONS

Input Characteristics:

Frequency:	Three separate input channels, one each for .1 Mc, 1 Mc, and 5 Mc.
Level:	The amplifier shall accept signals of up to 2 volts rms. An input level adjustment is provided for each input.
Impedance:	The input impedance is greater than 500 ohms at each input.

Output Characteristics:

*Number of Outputs:	Total of 30 output channels with 5 outputs at 5 Mc, 15 outputs at 1 Mc, and 10 outputs at .1 Mc.
Level:	The output level at each channel is 1.0 volt rms (-0/+3 db) across 50 ohms over temperature range when the input is a constant 1.0 volt rms.
Bandwidth:	The bandwidth of each frequency is less than 3% of input frequency for 3 db down and 15% for 30 db down.
Spurious:	Any spurious is more than 80 db below the desired output.
Harmonics:	All harmonics are greater than 60 db below the fundamental.

*See table 1-1 for applicable station variations.

Isolation:	With all inputs energized, the signal level at any output connector is changed less than ±.25 db when any other output is short-circuited. There is at least 50-db isolation between outputs from externally induced signals.
Cross-Talk:	With one input channel excited, the presence of that signal at any of the other frequency outputs shall be in excess of 50 db below the desired output level.
Noise & Hum Level:	Total noise and hum level is equivalent to an input of less than 100 microvolts rms at maximum gain.
Time Delay Jitter:	Less than 10^{-5} cycle rms for all three frequency instability of less than 1×10^{-11} standard deviation for a one second averaging time of 1 mc.
Power Requirements:	115 vac, ±10%, 50-400 cps single phase.

Mechanical:

Size:	3-1/2" high x 19" wide x 14" deep for standard rack mounting.
Weight:	Less than 20 pounds.
Connections:	3 insulated input and 30 output BNC connectors on rear.
Controls:	Power switch, pilot light and fuse on panel.

Environmental:

Non Operating:	Temperature -55°C to +72°C. Humidity: 0% to 100% relative.
Operating:	Operate to specifications from 0 to 50°C and 20% to 80% relative humidity. Survive and operate, but with degraded performance from 80% to 95% relative humidity.

Fuses and Semiconductors:

MDL 1/2	1	2N1039	1	2N2218	26
2N297A	1	2N1303	1	2N697	40

Table 1-1. Station Configuration, Distribution Amplifier

Station	Amplifier	Channel Desig.	Outputs (MHz's)
BDA and MAD	No. 1	1 thru 5	5 Mc
		6 thru 20	1 Mc
		21 thru 30	.1 Mc
	No. 2	1 thru 20	5 Mc
		21 thru 30	1 Mc
GDS and MIL	No. 1	1 thru 10	5 Mc
		11 thru 20	1 Mc
		21 thru 30	.1 Mc
	No. 2	1 thru 30	5 Mc

SECTION II

INSTALLATION

2-1. GENERAL

The unit should be unpacked and checked carefully for visible damage. The top cover should be removed and all printed circuit modules pressed firmly in place.

Installation of the Model 203-3 is straightforward. The unit is designed to be mounted in a standard 19" rack. Power cord, input connectors, input level adjust controls, and output connectors are all located on the rear apron of the instrument and are clearly marked as shown in figure 2-2. The front panel contains the power switch, pilot light and 1/2 amp slo-blo fuse. A typical interconnection diagram is shown in figure 2-1.

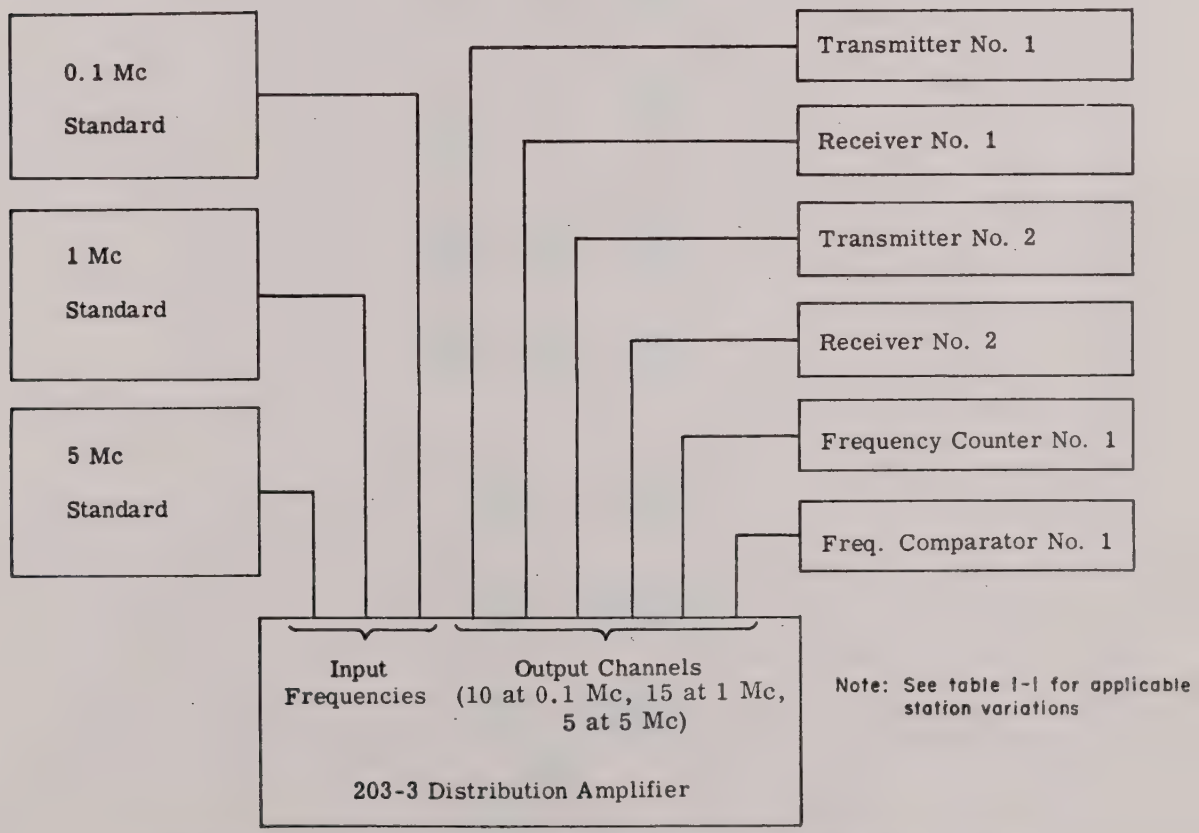
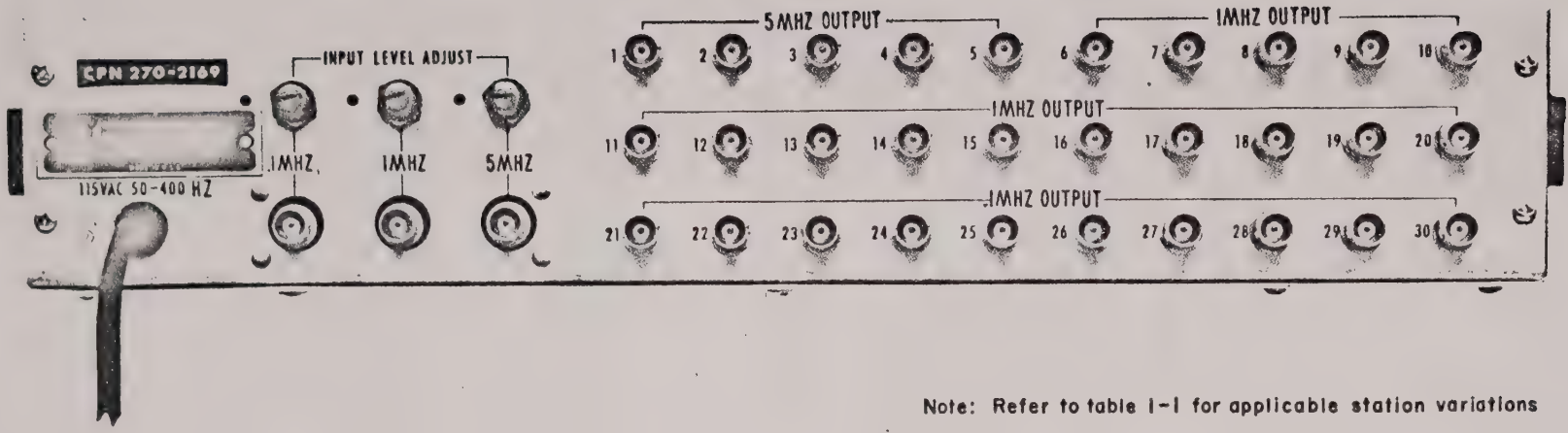

0.1 Mc Standard
1 Mc Standard
5 Mc Standard
Transmitter No. 1
Receiver No. 1
Transmitter No. 2
Receiver No. 2
Frequency Counter No. 1
Freq. Comparator No. 1
Input Frequencies
Output Channels (10 at 0.1 Mc, 15 at 1 Mc, 5 at 5 Mc)
203-3 Distribution Amplifier
Note: See table 1-1 for applicable station variations

Figure 2-1. TYPICAL 203-3 INTERCONNECTION DIAGRAM



Note: Refer to table 1-1 for applicable station variations

Figure 2-2. LOCATION OF INPUT AND OUTPUT CONNECTORS

SECTION III

OPERATION

3-1. CONTROLS, TERMINALS, AND INDICATORS

The following controls, terminals, and indicators are located on the front panel (figure 3-1) or the rear apron (figure 2-2) of the instrument.

a. The POWER switch applies line voltage to the primary of the power transformer.
b. The POWER lamp illuminates when the 22-volt dc power supply is operating.
c. The .5A SLO-BLO fuse holder contains a 0.5 ampere slow-blowing fuse which is located in the primary circuit of the transformer.
d. The 5MC, 1MC, and .1MC BNC input connectors are for connection to the 5 Mc, 1 Mc, and 0.1 Mc local frequency standards.
*e. The 5MC, 1MC, and .1MC OUTPUT BNC connectors provide five channels for 5 Mc (CH1 to CH 5), fifteen channels for 1 Mc (CH 6 to CH 20), and ten channels for 0.1 Mc (CH 21 to CH 30) frequencies to be distributed throughout a laboratory or manufacutring facility.
f. The INPUT LEVEL ADJUST controls for 5MC, 1MC, and .1MC are used to adjust the input level until the proper output level of 1 volt is available for the 5 Mc, 1 Mc, and 0.1 Mc channels.

3-2. OPERATING INSTRUCTIONS

a. Connect power plug to a 115-volt ac power outlet.
b. Connect 5 Mc, 1 Mc, and 0.1 Mc local frequency standards having a level between 1 and 2 volts to 5MC, 1MC, and .1MC BNC input connectors on rear of instrument.
c. Set POWER switch to ON. POWER lamp will illuminate, indicating that 22-volt dc power supply is operating.
d. Adjust 5MC INPUT LEVEL ADJUST control for an output level of 1 volt rms as measured with a suitable voltmeter (such as the Fluke Model 910A) at any output channel from 1 to 5 that is properly loaded with 50 ohms.
e. Adjust 1MC INPUT LEVEL ADJUST control for an output level of 1 volt rms on any channel from 6 to 20.
f. Adjust .1MC INPUT LEVEL ADJUST control for an output level of 1 volt rms on any channel from 21 to 30.

*For applicable station variations refer to paragraph 1-1, Section I, Introduction.

Figure 3-1. LOCATION OF FRONT PANEL CONTROLS AND INDICATORS

SECTION IV

THEORY OF OPERATION

4-1. INTRODUCTION

Figure 4-1 shows the block diagram for the 203-3 Distribution Amplifier. The circuit consists of three preamplifier modules, thirty amplifier modules, and a power supply module. The overall operation may be summarized as follows: An isolated BNC connector located on the rear panel is provided for each of the three input frequencies, 0.1 Mc, 1 Mc, and 5 Mc. Each connector feeds the applied signal to a preamplifier tuned to that frequency. The output of each preamplifier is applied to each and every amplifier module connector. Each amplifier module connector has its own BNC output connector on the rear panel. It is thus possible to have any of the three frequencies available at any one of the output connectors by inserting an amplifier module tuned to the desired frequency in the correct amplifier module connector. However, the rear panel is marked for, and the amplifier modules are inserted so that, channels 1 to 5 are for 5 Mc, channels 6 to 20 are for 1 Mc, and channels 21 to 30 are for 0.1 Mc. For applicable station variations refer to paragraph 1-1, Section I, Introduction.

4-2. PREAMPLIFIERS

Reference: Drawing No. 203-3-102 (.1 Mc) 203-3-103 (1 Mc), 203-3-104 (5 Mc)

The preamplifiers are similar except for the tuned circuit elements. Each preamplifier consists of a push-pull, common-emitter, class AB amplifier with a tuned-base input circuit and a tuned-collector output circuit. The INPUT LEVEL ADJUST on the rear apron allows for proper excitation of the preamplifier over a wide range of input levels. Diode CR1 and resistor R4 provide a slight forward bias to the push-pull transistors to minimize crossover distortion. Emitter resistors R2 and R3 provide both ac and dc stabilization. The preamplifier output is available at the secondary of T2.

4-3. AMPLIFIERS

Reference: Drawing No. 203-3-107 (.1 Mc), 203-3-106 (1 Mc), 203-3-105 (5 Mc)

The amplifier module is similar to the preamplifier module except that it has a double-tuned output circuit. This provides greater selectivity and rejection to harmonics. T2 and T3 work together to form a double-tuned circuit with the mutual coupling impedance being provided by C5. The double-tuned output stage

is under critically-coupled and hence has a single-humped response. When the amplifier output is loaded into 50 ohms most of the power is delivered to the load with very little loss in the tuned circuits. When the output is open-circuited the losses of T3 absorb most of the ac signal power. Consequently the dc power input to the stage remains essentially constant regardless of load. This also provides for a high degree of inter-channel isolation.

4-4. POWER SUPPLY

Reference: Drawing No. 203-3-101

The power supply consists of a step-down transformer and a bridge rectifier to convert the line voltage into nominally 30 volts dc. This is followed by a series-type regulator which provides relatively constant output voltage under varying line and load conditions. The output voltage is maintained at the nominal zener voltage of the voltage reference diode, CR5, which is 22 volts. If a change in the line voltage or load conditions tends to increase the output voltage, the base-emitter voltage of Q2 increases causing its collector current to increase which robs some of the base current from Q1 and subsequently reduces the base current of Q1 on the chassis, thus reducing the output voltage.

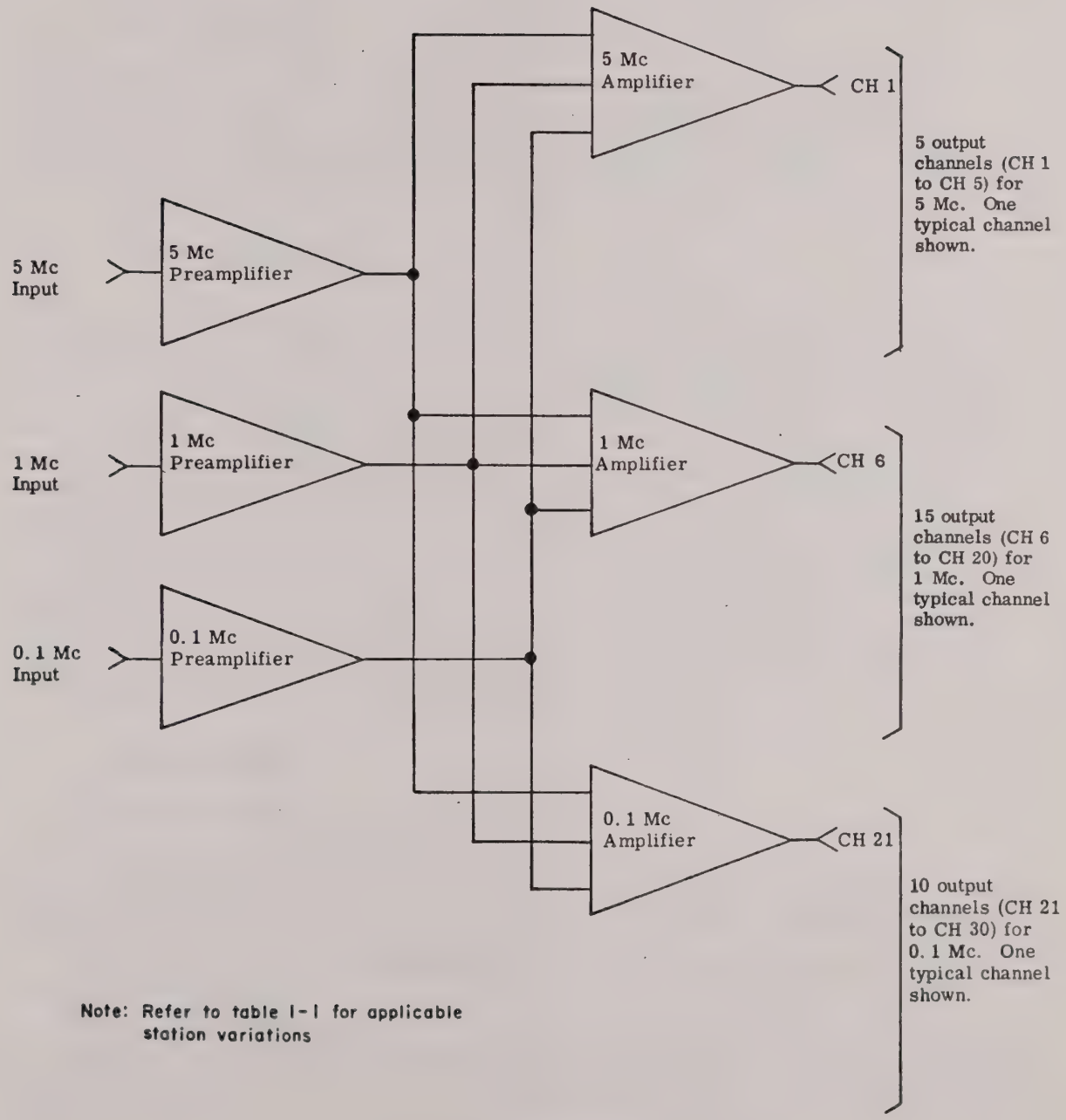

5 Mc Amplifier
CH 1
5 output channels (CH 1 to CH 5) for 5 Mc. One typical channel shown.
5 Mc Input
5 Mc Preamplifier
1 Mc Input
1 Mc Preamplifier
1 Mc Amplifier
CH 6
15 output channels (CH 6 to CH 20) for 1 Mc. One typical channel shown.
0.1 Mc Input
0.1 Mc Preamplifier
0.1 Mc Amplifier
CH 21
10 output channels (CH 21 to CH 30) for 0.1 Mc. One typical channel shown.
Note: Refer to table 1-1 for applicable station variations

Figure 4-1. BLOCK DIAGRAM FOR 203-3 DISTRIBUTION AMPLIFIER

SECTION V

MAINTENANCE

5-1. INTRODUCTION

The Model 203-3 is unusually easy to maintain because of its simplicity of operation, high degree of reliability, and accessibility of all components. Because of the modular construction, the preamplifiers, amplifiers, and power supply may be removed from the top of the instrument and placed on a module riser to facilitate calibration and troubleshooting.

5-2. TROUBLESHOOTING

The key to troubleshooting any electronic instrument is (1) fully understanding the operation of the instrument and each of its stages and (2) localizing the trouble to a stage and then a part through a logical troubleshooting procedure. Thus, an understanding of the theory of operation (Section IV) and frequent reference to the schematic diagrams will be of great value in troubleshooting. One of the best methods to localize the trouble to a stage is to perform the calibration procedure. If all three peramplifiers can not be aligned, the trouble is in the power supply. If one preamplifier can not be aligned, the trouble is in the preamplifier. If the preamplifiers are operating correctly and an amplifier can not be aligned, the trouble is in that amplifier. If their is trouble with gain in all the amplifiers, the power supply voltage is not within 5% of 22 vdc. If their is excessive noise at each of the amplifier outputs, the power supply probably has excessive ripple. A check of the transistor terminal voltages (figure 5-1) is also helpful at certain times.

5-3. CALIBRATION

5-4. PREAMPLIFIER ALIGNMENT

a. Connect 5 Mc, 1 Mc, and 0.1 Mc local frequency standards having a level between 1 and 2 volts to 5MC, 1MC, and .1MC BNC input connectors on rear of instrument.

b. Place module riser, 203-2-407, between preamplifier connector and preamplifier being aligned.

c. Set POWER switch to ON.

d. Adjust T1 and T2 on preamplifier module for maximum output as indicated on a suitable voltmeter (such as the FLUKE 910A) connected across pins 9 and 10 of the module.

e. Repeat steps b to d for remaining preamplifier modules

5-5. AMPLIFIER ALIGNMENT

a. Connect 5 Mc, 1 Mc, and 0.1 Mc local frequency standards having a level between 1 and 2 volts to 5MC, 1MC, and .1MC BNC input connectors on rear of instrument.

b. Place module riser, 203-2-407, between amplifier connector and amplifier being aligned.

c. Set POWER switch to ON.

d. Connect voltmeter ground lead to TP2 (circuit ground) and input lead to TP1 (collector of Q1).

e. Short amplifier output by connecting special shorting BNC connector, 203-2-412, to amplifier output connector.

f. Adjust T1 and T2 for maximum indication on voltmeter.

NOTE

The INPUT LEVEL ADJUST control should be adjusted so that the voltmeter indicates less than 10 volts. Otherwise collector limiting will occur and the adjustment of T1 and T2 will not vary the collector level.

g. Remove shorting connector and adjust T3 for a minimum voltmeter indication.

h. Repeat steps b to g for remaining amplifier modules.

5-6. AMPLIFIER GAIN

a. Connect 5 Mc, 1 Mc, and 0.1 Mc local frequency standards having a level between 1 and 2 volts to 5MC, 1MC, and .1MC BNC input connectors on rear of instrument.

b. Place module riser, 203-2-407, between preamplifier connector and 5 Mc preamplifier.

c. Set POWER switch to ON.

d. Adjust INPUT LEVEL ADJUST control for a preamplifier output of 1.25 volts as measured with a voltmeter across pins 9 and 10

e. Repeat steps b to d for 1 Mc and 0.1 Mc preamplifier modules.

f. Place module riser between amplifier connector and amplifier being adjusted.

g. Adjust R1 on amplifier module for an output level of 1.25 volts as measured with a voltmeter at the corresponding output connector properly loaded with 50 ohms.

NOTE

At this level the collectors of the preamplifier transistors should show about 4.5 vac for 0.1 Mc, 5.0 vac for the 1 Mc, and 5.7 vac for the 5 Mc. The amplifier transistor collector (TP1) should show about 4.8, 2.5, and 1.8 vac for 0.1 Mc, 1 Mc, and 5 Mc respectively.

h. Repeat steps f and g for remaining amplifier modules.

TRANSISTOR	EMITTER	BASE	COLLECTOR
203-3-100 Q1	0	-0.37	-6.2
203-3-101 Q1	-0.37	-0.5	-6.2
203-3-101 Q2	22	21.8	-0.5
203-3-102 Q1	0.24	0.66	21.9
203-3-102 Q2	0.24	0.66	21.9
203-3-103 Q1	0.24	0.66	21.9
203-3-103 Q2	0.24	0.66	21.9
203-3-104 Q1	0.03	0.51	21.9
203-3-104 Q2	0.03	0.51	21.9
203-3-105 Q1	0.03	0.51	21.9
203-3-105 Q2	0.03	0.51	21.9
203-3-106 Q1	0.24	0.66	21.9
203-3-106 Q2	0.24	0.66	21.9
203-3-107 Q1	0.24	0.66	21.9
203-3-107 Q2	0.24	0.66	21.9

The above operating voltage levels are measured under the following conditions: (a) POWER switch set to ON; (b) 5 Mc, 1 Mc, and 0.1 Mc local frequency standards connected to input; (c) all measurements made from chassis ground to specified terminal with a 20,000 ohms per volt voltmeter; (d) all voltages are dc; (e) voltages may vary as much as 15 to 20%; (f) bias voltages (difference between emitter and base voltages) should remain approximately the same.

Figure 5-1. TRANSISTOR OPERATING VOLTAGE LEVELS

SECTION VI

PARTS LIST

The parts used in this unit have been carefully selected to assure maximum reliability. Should component replacement become necessary, identical components should be used. All parts are available from the manufacturers indicated on the parts list or from MONTRONICS, INC. Any abbreviations or contractions used here or on the schematics are standard in the industry.

0.1 MC PREAMPLIFIER, 203-3-402, Drawing No. 203-3-102

Reference Designation	Description	Type	Manufacturer
C1, 2	Capacitor, .037 ufd	1PC373G	Arco
C5	Capacitor, disc, .68 ufd, 25 V	5C12	Sprague
CR1	Diode	154799	Montronics
FL1	Inductor, 330 uh	WEE-330	Essex
P1	Connector, 10 Pin	149369	Montronics
Q1, 2	Transistor	2N2218	Motorola
R1	Resistor, composition, 1/4 W, 5%, 680 ohms	148007	Montronics
R2, 3	Resistor, composition, 1/4 W, 5%, 15 ohms	147876	Montronics
R4	Resistor, composition, 1/4 W, 5%, 15 K	148114	Montronics
R6	Resistor, composition, 1/4 W, 5%, 2.2 K	148049	Montronics
T1	Transformer	203-613	Montronics
T2	Transformer	203-610	Montronics
	Transipads	152207	Montronics
	.1 MC Preamp PCB	203-3-302	Montronics

1 MC PREAMPLIFIER, 203-3-403, Drawing No. 203-3-103

Reference Designation	Description	Type	Manufacturer
C1	Capacitor, Dipped Mica, 3900 pf 5%	160325	Montronics
C2	Capacitor, dipped mica, 5000 pf 5%	CD19F502J	Federal Pacific
C3, 4	Capacitor, dipped mica, 5 pf 10%	148577	Montronics
C5	Capacitor, disc, .05 ufd, 50 V, +80%, -20%	159161	Montronics
CR1	Diode	154799	Montronics
FL1	Inductor, 330 uh	WEE-330	Essex
P1	Connector, 10 Pin	149369	Montronics
Q1, 2	Transistor	2N2218	Motorola
R1	Resistor, composition, 1/4 W, 5%, 470 ohms	147983	Montronics
R2, 3	Resistor, composition, 1/4 W, 5%, 15 ohms	147876	Montronics
R4	Resistor, composition, 1/4 W, 5%, 15 K	148114	Montronics
R6	Resistor, composition, 1/2 W, 5%, 2.2K	108506	Montronics
T1	Transformer	203-618	Montronics
T2	Transformer	203-604	Montronics
	Transipads	152207	Montronics
	1 MC Preamplifier PCB	203-3-303	Montronics

5 MC PREAMPLIFIER, 203-3-404, Drawing No. 203-3-104

Reference Designation	Description	Type	Manufacturer
C1, 2	Capacitor, dipped mica, 1000 pf 5%	148387	Montronics
C3, 4	Capacitor, dipped mica, 5 pf 5%	148577	Montronics
C5	Capacitor, Disc, .05 uf, 50 V, +80%, -20%	149161	Montronics
CR1	Diode	154799	Montronics
FL1	Inductor, 22 uh, 10%	147843	Montronics
P1	Connector, 10 Pin	149369	Montronics
Q1, 2	Transistor	2N2218	Motorola
R1	Resistor, composition, 1/4 W, 5%, 390 ohms	147975	Montronics
R2, 3	Resistor, composition, 1/4 W, 5%, 10 ohms	147876	Montronics
R4	Resistor, composition, 1/4 W, 5%, 15 K	148114	Montronics
R6	Resistor, composition, 1/2 W, 5%, 2.2 K	108506	Montronics
T1	Transformer	203-619	Montronics
T2	Transformer	203-607	Montronics
	Transipads	152207	Montronics
	5 MC Preamplifier PCB	203-3-304	Montronics

POWER SUPPLY. 203-3-401, Drawing No. 203-3-101

Reference Designation	Description	Type	Manufacturer
C1	Capacitor, disc, .68 ufd, 25 V	5C12	Sprague
CR1 through 4	Diode	1N4002	Motorola
CR5	Diode, Zener	1N969B	Motorola
P1	Connector, 10 Pin	149369	Montronics
Q1	Transistor	2N1039	Texas Instruments
Q2	Transistor	2N1303	Texas Instruments
R1	Resistor, composition, 1 W, 5%, 680 ohms	GB6815	Allen-Bradley
R2	Resistor, composition, 1 W, 5%, 1.8 K	GB1825	Allen-Bradley
R3	Resistor, composition, 1/4 W 5%, 68 ohms	147918	Montronics
	Heat Sink (2 required)	104562	Montronics
	Transipads	152207	Montronics
	Power Supply PCB	203-3-301	Montronics

.1 MC AMPLIFIER, 203-3-407, Drawing No. 203-3-107

Reference Designation	Description	Type	Manufacturer
C1	Capacitor, .037 ufd	1PC373G	Arco
C2	Capacitor, .015 ufd	1PC153G	Arco
C3	Capacitor, 01 ufd, ±2%, 100 V	168385	Montronics
C4	Capacitor, disc, .68 uf, 25 V	5C12	Sprague
C5	Capacitor, dipped mica, 1500 pf 5%	148361	Montronics
CR1	Diode	154799	Montronics
FL1	Inductor, 330 uh, 5%	WEE-330	Essex
P1	Connector, 10 Pin	149369	Montronics
Q1, 2	Transistor	2N697	Motorola
R1	Potentiometer, Series 4, Type 600-1, 10 K	600-1	Centralab
R2, 3	Resistor, composition, 1/4 W 5%, 15 ohms	147876	Montronics
R4	Resistor, composition, 1/4 W 5%, 15 K	148114	Montronics
R5	Resistor, composition, 1/4 W 5%, 10 ohms	148007	Montronics
T1	Transformer	203-610	Montronics
T2	Transformer	203-611	Montronics
T3	Transformer	203-612	Montronics
	Terminal Post	2010B	Litton Industries
	Transipads	152207	Montronics
	.1 MC Amplifier PCB	203-3-407	Montronics

1 MC AMPLIFIER, 203-3-406, Drawing No. 203-3-106

Reference Designation	Description	Type	Manufacturer
C1, 2	Capacitor, dipped mica, 5000 pf, 5%, 100 V	CD19F502J	Federal Pacific
C3	Capacitor, dipped mica, 1200 pf, 5%, 100 V	148379	Montronics
C4	Capacitor, disc, .05 uf, 50 V +80%, -20%	149161	Montronics
C5	Capacitor, dipped mica, 330 pf, 5%, 100 V	148445	Montronics
C6, 7	Capacitor, dipped mica, 5 pf, 5%, 100 V	148577	Montronics
CR1	Diode	154799	Montronics
FL1	Inductor, 330 uh, 5%	WEE-330	Essex
P1	Connector, 10 Pin	149369	Montronics
Q1, Q2	Transistor	2N697	Motorola
R1	Potentiometer, Series 4, Type 600-1, 500 ohms	600-1	Centralab
R2, 3	Resistor, composition, 1/4 W, 5%, 15 ohms	147876	Montronics
R4	Resistor, composition, 1/4 W, 5%, 15 K	148114	Montronics
R5	Resistor, composition, 1/4 W, 5%, 220 ohms	147868	Montronics
T1, 2	Transformer	203-604	Montronics
T3	Transformer	203-606	Montronics
	Terminal Post	2010B	Litton Industries
	Transipads	152207	Montronics
	1 MC Amplifier PCB	203-3-306	Montronics

5 MC AMPLIFIER, 203-3-405, Drawing No. 203-3-105

Reference Designation	Description	Type	Manufacturer
C1, 2	Capacitor, dipped mica, 1500 pf 5%	148361	Montronics
C3	Capacitor, dipped mica, 270 pf 5%	148452	Montronics
C4	Capacitor, disc, .05 uf, 50 V +80%, -20%	149161	Montronics
C5	Capacitor, dipped mica, 120 pf 5%	148486	Montronics
C6, 7	Capacitor, dipped mica, 5 pf 5%	148577	Montronics
CR1	Diode	154799	Montronics
FL1	Inductor, 22 uh, 10%	147843	Montronics
P1	Connector, 10 Pin	149369	Montronics
Q1, Q2	Transistor	2N2218	Motorola
R1	Potentiometer, Series 4, Type 600-1, 500 ohms	600-1	Centralab
R2, 3	Resistor, composition, 1/4 W, 5%, 15 ohms	147876	Montronics
R4	Resistor, composition, 1/4 W, 5%, 68 K	148171	Montronics
R5	Resistor, composition, 1/4 W, 5%, 10 ohms	147967	Montronics
T1, 2	Transformer	203-607	Montronics
	Terminal Post	2010B	Litton Industries
	Transipads	152207	Montronics
	5 MC Amplifier PCB	203-3-305	Montronics

CHASSIS, 203-3-400, Drawing No. 203-3-100

Reference Designation	Description	Type	Manufacturer
C1	Capacitor, electrolytic, 1500 uf 50 V	505-3832-02	Sangamo Electric
C2, 3	Capacitor, Disc, .05 uf, 500 V	105676	Montronics
C4	Capacitor, electrolytic, 100 uf 25 V	106518	Montronics
DS1	Lamp	153106	Montronics
	Light Holder, pilot	153114	Montronics
F1	Fuse, 1/2 amp, Slo-Blo	109322	Montronics
	Fuse Holder	100107	Montronics
J1 through J33	Connector, BNC	152033	Montronics
J34 through 67	Connector, 10 Pin	149401	Montronics
Q1	Transistor	2N297A	Motorola
	Transistor Mounting Kit	MK-20	Motorola
R1, 2 & 3	Potentiometer, 2 K ohms	112466	Montronics
S1	Switch, toggle, SPST, 3A	114850	Montronics
T1	Transformer	203-651	Montronics

WARRANTY

MONTRONICS, INC., warrants each instrument manufactured by them to be free from defects in material and workmanship. Their obligation under this Warranty is limited to servicing or adjusting an instrument returned to the factory for that purpose, and to making good at the factory any part or parts thereof; except tubes, fuses, choppers and batteries, which shall, within one year after making delivery to the original purchaser, be returned by the original purchaser with transportation charges prepaid, and which upon their examination shall disclose to their satisfaction to have been thus defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at a nominal cost. In this case, an estimate will be submitted before work is started, if requested.

If any fault develops, the following steps should be taken:

1. Notify MONTRONICS, INC., giving full details of the difficulty, and include the Model number, type number, and serial number. On receipt of this information, service data or shipping instructions will be forwarded to you.

2. On receipt of the shipping instructions, forward the instrument, prepaid, and repairs will be made at the factory. If requested, an estimate of the charges will be made before the work begins, provided the instrument is not covered by the Warranty.

SHIPPING

All shipments of MONTRONICS, INC., instruments should be made via airfreight prepaid. The instrument should be shipped in the original packing carton, or if it is not available, use any suitable container that is rigid. If a substitute container is used, the instrument should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material.

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be thoroughly inspected immediately upon receipt. All material in the container should be checked against the enclosed packing list. The manufacturer will not be responsible for shortages against the packing sheet unless notified immediately. If the instrument fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent, and this report should be forwarded to MONTRONICS, INC. Upon receipt of this report you will be advised of the disposition of the equipment for repair or replacement. Include the model number, type number, and serial number when referring to this instrument for any reason.

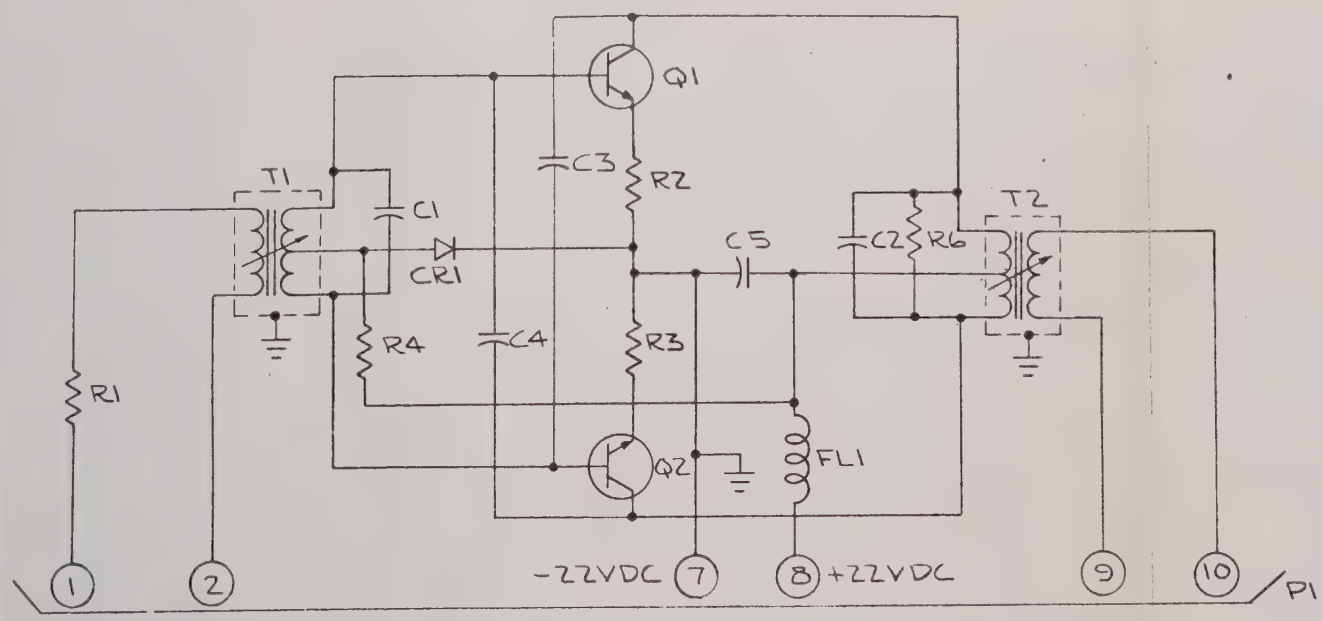
MONTRONICS, INC., will be happy to answer all application questions which will enchance your use of this instrument. Please address your requests to:

MONTRONICS, INC., SUBSIDIARY OF JOHN FLUKE MFG. CO., INC., P. O. BOX 7428, SEATTLE 33, WASHINGTON, 98133. TELEPHONE (206) 776-3141

APPLICATION		
NEXT ASSY	U.S.A. NUMBER	PART NO

THIS DRAWING OR SPECIFICATION CONSTITUTES THE CONFIDENTIAL INFORMATION OF MONTRONICS, INC., AND ITS RECEIPT OR POSSESSION DOES NOT CONVEY ANY RIGHT IN OR LICENSE TO USE IT OR THIS DRAWING OR SPECIFICATION NOR ANY PART HEREOF WITHOUT THE WRITTEN CONSENT OF MONTRONICS, INC.

SYM	ZONE	DESCRIPTION	DATE	APPROVAL



	5MC PREAMP 203-3-104	1MC PRE AMP. 203-3-103	.1MC PRE AMP 203-3-102
C1	1000PF	3900PF	.037UF
C2	1000PF	5000PF	.037UF
C3	5PF	5PF	NOT USED
C4	5PF	5PF	NOT USED
C5	.05UF	.05UF	.68UF
R1	390Ω	470Ω	680Ω
R2	10Ω	15Ω	15Ω
R3	10Ω	15Ω	15Ω
R4	15KΩ	15KΩ	15KΩ
R5	NOT USED	NOT USED	NOT USED
R6	2.2KΩ ½W.	2.2KΩ ½W.	2.2KΩ
T1	203-619	203-618	203-613
T2	203-607	203-604	203-610
Q1	2N2218	2N2218	2N2218
Q2	2N2218	2N2218	2N2218
FL1	22UH	330UH	330UH
CR1	1N483B	1N483B	1N483B
P1			

NOTES

1. SEE TABLE FOR ALL COMPONENT VALUES.
2. ALL FIXED RESISTORS ARE ¼ WATT, 5% UNLESS NOTED

RELEASE	QTY REQ'D	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	ZONE	MATERIAL	FINISH	PT. MK	SYM	ITEM NO.
			LIST OF MATERIAL							

DO NOT SCALE DRAWING	ELEC APPD	DATE	MONTRONICS INC. BOZEMAN, MONTANA SUBSIDIARY OF JOHN FLUKE MFG CO INC
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	MECH APPD		5MC, 1MC, .1MC PRE-AMPLIFIER
ANGULAR TOLERANCE	CHECKED		
DECIMAL 2 PL TOLERANCE	DRAWN DAVE MITCHELL	12/20/64	
DECIMAL 3 PL TOLERANCE			
DIMENSIONING & TOLERANCING PER MIL-STD-8 PART MARKING IN ACCORDANCE WITH MIL-STD-130A	DESIGN APPROVAL [signature]	12/30/64	CODE IDENT NO. / SIZE C / 203-3-104-5 103-1 102-1
			SCALE / SHEET

APPLICATION		
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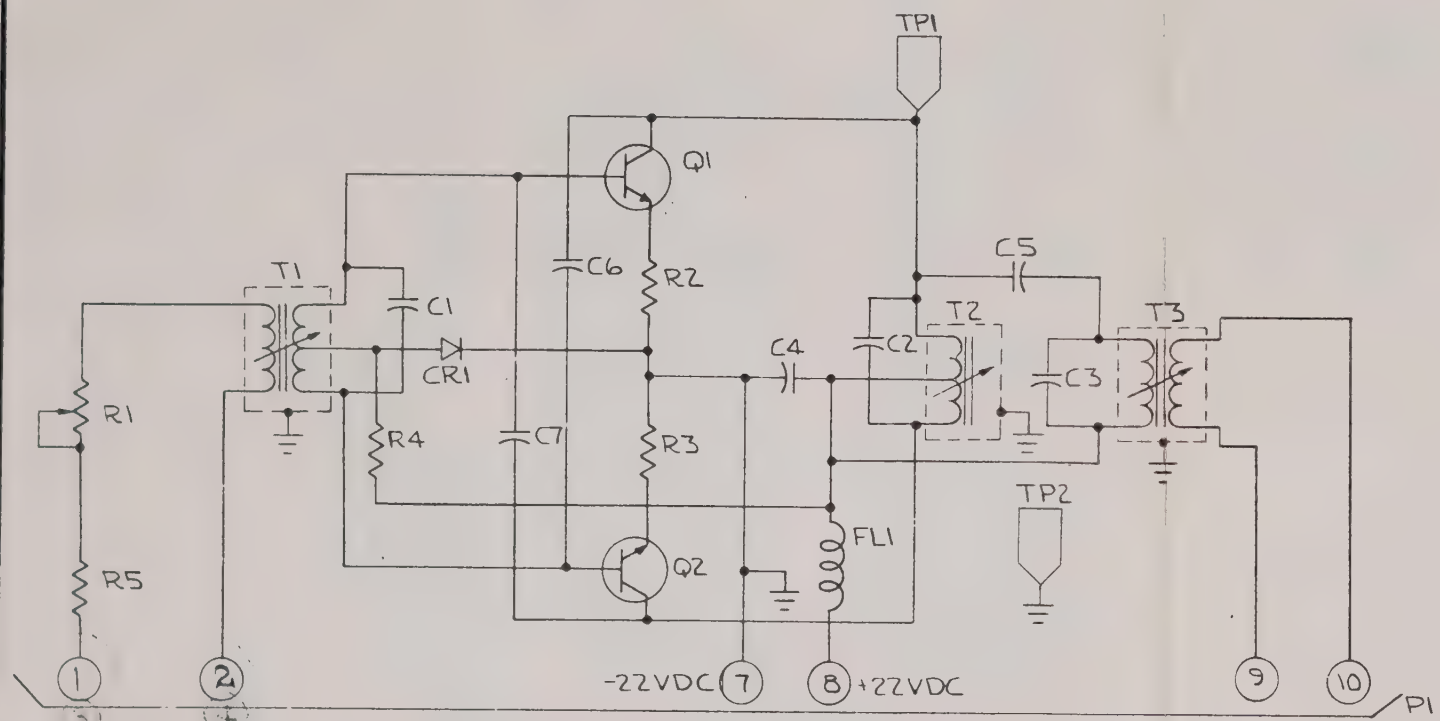
REVISIONS				
SYM	ZONE	DESCRIPTION	DATE	APPROVAL



	SMC AMP 203-3-105	IMC AMP 203-3-106	.IMC AMP 203-3-107
INPUT PINS	1 & 2	3 & 4	5 & 6
C1	1500 PF	5000 PF	.037 UF
C2	1500 PF	5000 PF	.015 UF
C3	270 PF	1200 PF	.01 UF
C4	.05 UF	.05 UF	.68 UF
C5	120 PF	330 PF	1500 PF
C6	5 PF	5 PF	NOT USED
C7	5 PF	5 PF	NOT USED
R1	500 Ω	500 Ω	10K Ω
R2	15 Ω	15 Ω	15 Ω
R3	15 Ω	15 Ω	15 Ω
R4	68K Ω	15K Ω	15K Ω
R5	10 Ω	220 Ω	10 Ω
T1	203-607	203-604	203-610
T2	203-607	203-604	203-611
T3	203-609	203-606	203-612
Q1	2N2218	2N697	2N697
Q2	2N2218	2N697	2N697
FL1	22 UH	330 UH	330 UH
CR1	IN483B	IN483B	IN483B

P1

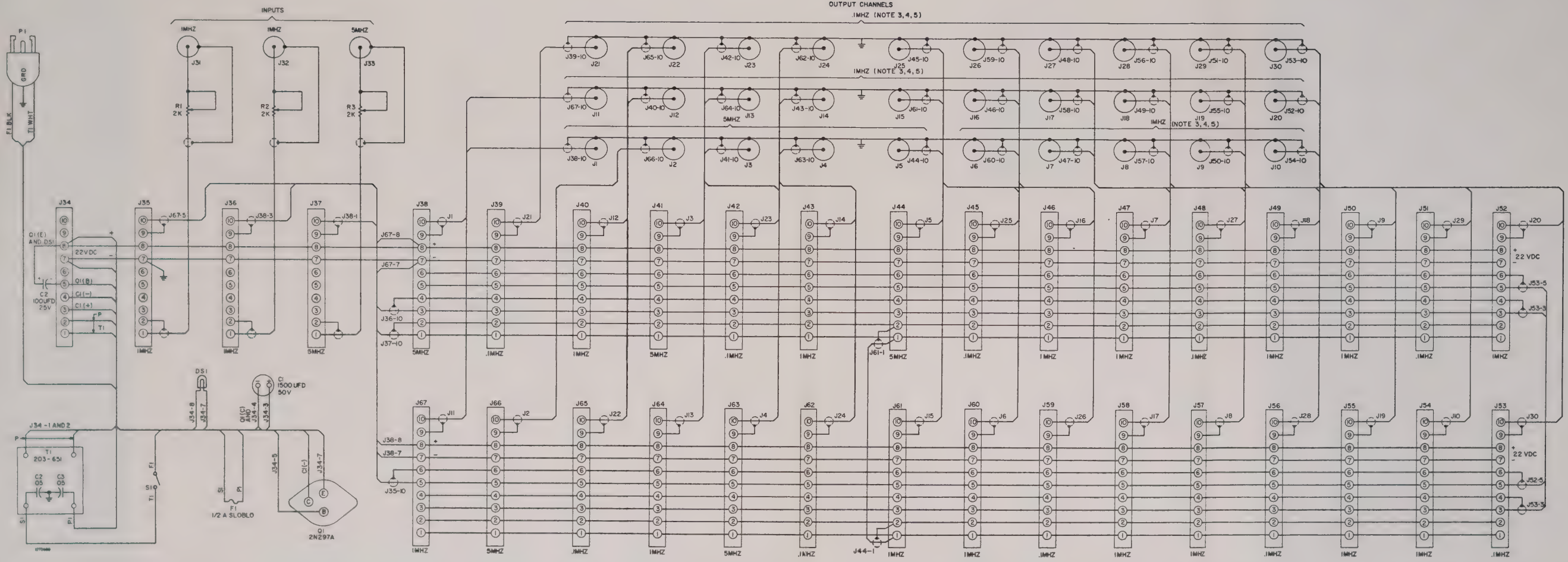
NOTES

1. SEE TABLE FOR ALL COMPONENT VALUES & INPUT PIN NUMBERS
2. ALL FIXED RESISTORS ARE 1/4 WATT, 5%

RELEASE	QTY REQ'D	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	ZONE	MATERIAL	FINISH	PT - MK	SYM	ITEM NO.

LIST OF MATERIAL

DO NOT SCALE DRAWING	ELEC APPD	DATE	MONTRONICS INC. BOZEMAN, MONTANA SUBSIDIARY OF JOHN FLUKE MFG CO INC
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	MECH APPD		5MC, IMC, .IMC AMPLIFIER'S
ANGULAR TOLERANCE	CHECKED		
DECIMAL 2 PL TOLERANCE	DRAWN	2/4/64	
DECIMAL 3 PL TOLERANCE			
DIMENSIONING & TOLERANCING PER MIL-STD-8 PART MARKING IN ACCORDANCE WITH MIL-STD-130A	DESIGN APPROVAL 12/31/64		CODE IDENT NO. C SIZE 203-3-105-5 106-1 107-1
			SCALE SHEET



NOTES:
1. J35-37 PRE-AMPLIFIERS
2. J38-67 AMPLIFIERS
3. AT BDA AND MAD - UNIT 1 AS SHOWN
   UNIT 2, J6 THRU J20 ARE 5 MHZ,
   J21 THRU J30 ARE 1 MHZ
4. AT GDS AND MIL-UNIT 1, J1 THRU J10 ARE 5 MHZ,
   J11 THRU J20 ARE 1 MHZ,
   J21 THRU J30 ARE 0.1 MHZ
5. AT GDS AND MIL-UNIT 2, J1 THRU J30 ARE 5 MHZ

CHASSIS WIRING DIAGRAM

Revised November 3, 1975

FI BLK

APPLICATION		
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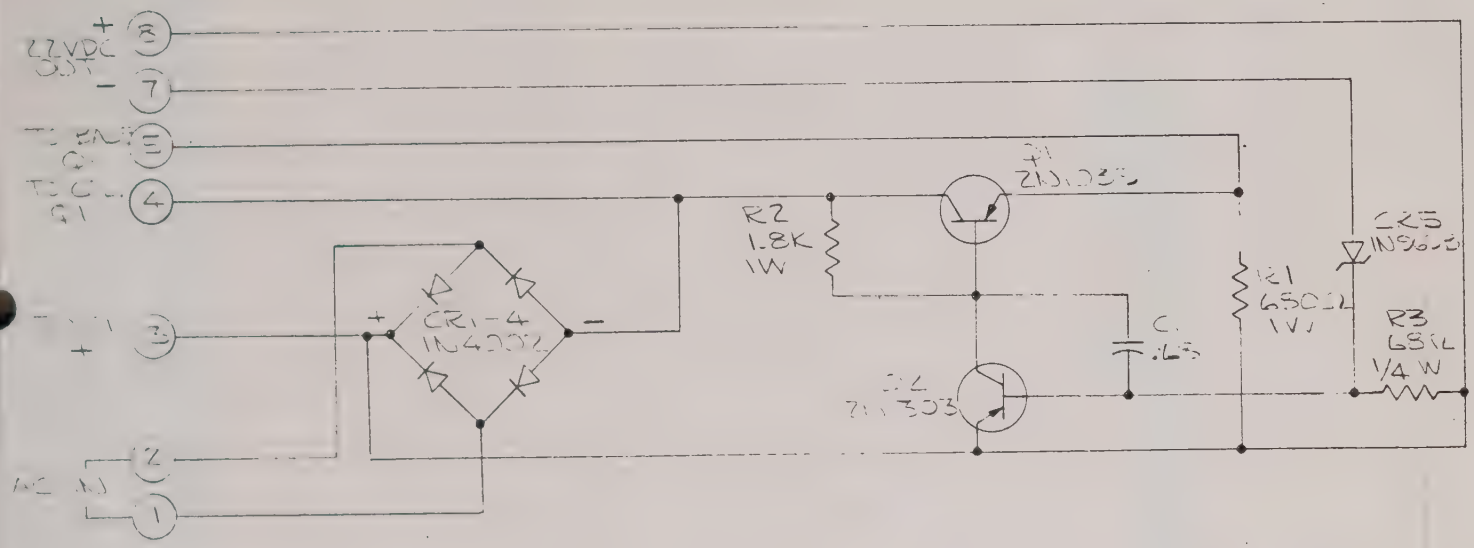
REVISIONS				
SYM	ZONE	DESCRIPTION	DATE	APPROVAL



NOTES
1. Q1 & Q2 USE 104562 TRANSISTOR HEATSINKS
2. ALL CAPACITOR VALUES ARE .1 UFD

ELEC APPD	DATE	BOZEMAN MONTRONICS, INC. MONTANA	
MECH APPD		POWER SUPPLY	
CHECKED			
DRAWN	12/27/[illegible]		
DESIGN APPROVAL [illegible] 12-[illegible]		CODE IDENT NO.	SIZE B 203-3-101
		SCALE	SHEET

TYPEFACE SPECIMEN SHEET

Copy for revised pages in technical manual ME-1653 was prepared using an IBM Executive Typewriter with boldface 2 typeface. Repro is enlarged to 112%.

Revised November 3, 1975

EQUIPMENT DOCUMENTATION

(TECHNICAL MANUALS AND DRAWINGS)

CHANGE REQUEST SHEET

MANUAL OR DRAWING NO. _____

Use this sheet to indicate changes or corrections which will update or improve technical manuals and drawings. When completed, mail the sheet to:

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

Attention: A. T. Dannessa
Code 864.1

Comments: _____

Originator's Name: _____ **Date:** _____

Organization: _____ **Title:** _____

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STDN No. 2010 (4/75)

Sheet ____ **of** ____

EQUIPMENT DOCUMENTATION

(TECHNICAL MANUALS AND DRAWINGS)

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STDN No. 2010 (4/75) Sheet ____ of ____

Typeface Specimen Sheet

The typeface used on this revision dated

March 7, 1969, is IBM Bold Face Number 1.

Revised March 7, 1969